

AMENDMENTS TO THE CLAIMS

Please amend Claims 1-10, 14, 16-24, and 26-33; and add new Claim 34 as follows.

LISTING OF CLAIMS

1. (currently amended) A heat exchanger for ~~[[heat]]~~ exchanging heat between an exhaust gas of an internal combustion engine and a cooling fluid, the heat exchanger comprising:

a plurality of flat exhaust gas passages through which said exhaust gas flows therein; and

a ~~plurality~~ plurality of corrugated fins arranged in each of said exhaust gas passage ~~passages~~ to promote heat exchanging between said exhaust gas and said cooling fluid, each of said ~~[[fin]]~~ fins including a ~~plurality~~ plurality of flat plate portions~~[[,]]~~ and a plurality plurality of side wall portions as viewed from a direction of the exhaust gas flow; wherein ~~and a louvre disposed on the inner wall of said exhaust gas passage, wherein the louvre defining a surface thereof arranged along the exhaust gas flow direction, has a height from said inner wall increase towards upstream of said exhaust gas flow, and said louvre is inclined with predetermined angle to a direction of said exhaust gas flow.~~

a plurality of louvres are disposed on inner walls of said exhaust gas passages along the direction of the exhaust gas flow, a surface of each of said louvres having a height measured from said inner wall which increases in the direction of said exhaust gas flow.

2. (currently amended) A heat exchanger according to claim 1,
wherein ~~[[a]]~~ the plurality of ~~[[said]]~~ louvres are configured of a ~~plurality~~
plurality of pairs of said louvres,
and a gap between each said louvres gradually increases towards
downstream of said exhaust gas.

3 (currently amended) A heat exchanger according to claim 2,
wherein said ~~corrugated fins each include~~ a plurality of flat plate portions
are substantially parallel to the ~~long diameter~~ direction of said exhaust gas ~~passage~~ flow
and ~~[[a]]~~ said plurality of side wall portions are formed at an angle to said flat plate
portions as viewed from the direction of the exhaust gas flow, and
wherein said louvres are each formed by cutting parts of each of said flat
plate portions.

4. (currently amended) A heat exchanger according to claim 3,
wherein holes formed by cutting ~~[[up]]~~ parts of each of said flat plate
portions are closed by defining members defining said exhaust gas passages.

5. (currently amended) A heat exchanger according to claim 2,
wherein ~~[[the]]~~ upstream end portions of each of said ~~[[sets]]~~ pairs of
~~[[said]]~~ louvres in said exhaust gas flow are arranged in a spaced relation with each
other.

6. (currently amended) A heat exchanger according to claim 2,
wherein ~~[[the]]~~ a distance (δ) between ~~[[the]]~~ a downstream end of each of
said louvres in said exhaust gas flow and said side wall portion is not less than 0.5
times as large as the maximum height (h) of said louvre but more than twice as large as
the maximum height (h) of said louvre.

7. (currently amended) A heat exchanger according to claim 6,
wherein the distance (δ) between the downstream end of each of said
~~louvres~~ louvres in said exhaust gas ~~[[flow]]~~ passage and said side wall portion is not less
than 0.5 times as large as the maximum height (h) of said louvre but not more than the
maximum height (h) of said louvre.

8. (currently amended) A heat exchanger according to claim 1,
wherein ~~[[a]]~~ the plurality of ~~[[said]]~~ louvres are arranged in a staggered
fashion at an angle to said direction of said exhaust gas flow along said exhaust gas
flow.

9. (currently amended) A heat exchanger according to claim 8,
wherein ~~[[the]]~~ a distance (δ_2) between ~~[[the]]~~ a rear end portion of each of
said ~~louvre~~ louvres and said side wall portion adjacently arranged at an angle to said flat
plate portion having said louvre is larger than ~~[[the]]~~ a distance (δ_1) between ~~[[the]]~~ a
forward end portion of said louvre and said side wall portion adjacently arranged at
~~[[an]]~~ the angle to said flat plate portion having said louvre.

10. (currently amended) A heat exchanger according to claim 8,

wherein, of ~~[[a]]~~ the plurality of ~~[[said]]~~ louvres, ~~[[the]]~~ an upstream louvre located upstream in said exhaust gas flow and ~~[[the]]~~ a downstream louvre located downstream in said exhaust gas flow adjacently to said upstream louvre are arranged in such a manner that ~~[[the]]~~ a forward end portion of said downstream louvre in said direction of said exhaust gas flow is located downstream of ~~[[the]]~~ a rear end portion of said upstream louvre in said direction of said exhaust gas flow.

11. (original) A heat exchanger according to claim 10,

wherein said upstream louvre and said downstream louvre are arranged in superposed relation with each other as viewed from the direction of said exhaust gas flow.

12. (withdrawn) The heat exchanger according to claim 10,

wherein said upstream louvre and said downstream louvre are arranged in such a manner that the forward end portion of said upstream louvre and the rear end portion of said downstream louvre are displaced from each other as viewed from the direction of said exhaust gas flow.

13. (withdrawn) A heat exchanger according to claim 10,

wherein said upstream louvre and said downstream louvre are arranged in such a manner that the rear end portion of said upstream louvre and the forward end

portion of said downstream louvre are displaced from each other as viewed from the direction of said exhaust gas flow.

14. (currently amended) A heat exchanger according to claim 10,

wherein said upstream louvre and said downstream louvre are arranged in such a manner that ~~[[the]]~~ a forward end portion of said upstream louvre and ~~[[the]]~~ a rear end portion of said downstream louvre are substantially in superposed relation with each other as viewed from the direction of said exhaust gas flow.

15. (original) A heat exchanger according to claim 10,

wherein said upstream louvre and said downstream louvre are arranged in such a manner that the rear end portion of said upstream louvre and the forward end portion of said downstream louvre are substantially in a superposed relation with each other as viewed from the direction of said exhaust gas flow.

16. (currently amended) A heat exchanger according to claim 8,

wherein ~~[[the]]~~ an angle of ~~[[the]]~~ a corner of ~~[[the]]~~ an apex portion at ~~[[the]]~~ a rear end portion of ~~the louvre~~ at least one of the louvres, for which the distance from said flat plate portion is longest, is not less than ~~about~~ 90°.

17. (currently amended) A heat exchanger according to claim 8,

wherein ~~[[the]]~~ a contour of ~~[[the]]~~ an apex portion at ~~[[the]]~~ a rear end portion of ~~the louvre~~ at least one of the louvres, for which the distance from said flat plate portion is longest, is a smooth curve.

18. (currently amended) A heat exchanger according to claim 8,

wherein said louvres are formed substantially ~~[[in]]~~ as a trapezoid in such a manner as to have a surface of which the distance from the flat plate portion increases progressively downstream in the direction of exhaust gas flow.

19. (currently amended) A heat exchanger according to claim 8,

wherein ~~[[the]]~~ a distance ($\delta 2$) between ~~[[the]]~~ a rear end portion of each of said ~~louvre~~ louvres and said side wall portion is not less than 0.15 times as large as the maximum height (h) of said louvre but not more than twice as large as the maximum height (h) of said louvre.

20. (currently amended) A heat exchanger according to claim 19,

wherein the distance ($\delta 2$) between the rear end portion of each of said louvres in said exhaust gas passages and said side wall portion is not less than 0.15 times as large as the maximum height (h) of said louvre but not more than the maximum height (h) of said louvre.

21. (currently amended) A heat exchanger according to claim 10,

wherein ~~[[the]]~~ a distance ($\delta 1$) between the forward end portion of said downstream louvre and said side wall portion is not less than 0.15 times as large as the maximum height (h) of said louvre but not more than twice as large as the maximum height (h) of said louvre.

22. (currently amended) A heat exchanger according to claim 21,
wherein the distance ($\delta 1$) between ~~[[the]]~~ a forward end portion of each of said louvres in said exhaust gas passages and ~~[[said]]~~ a respective side wall portion is not less than 0.15 times as large as the maximum height (h) of said louvre but not more than the maximum height (h) of said louvre.

23. (currently amended) A heat exchanger according to claim 10,
wherein ~~[[the]]~~ a tilt angle (θ) of each of said ~~louvre~~ louvres with respect to said direction of exhaust gas flow is not less than 15° but not more than 45° .

24. (currently amended) A heat exchanger according to claim 1,
wherein each of ~~those parts of the inner~~ wall of said exhaust gas passage (~~tube~~) which corresponds to ~~[[said]]~~ a respective flat plate portion of said corrugated fin is formed with a second protrusion projected inward of said exhaust gas passage.

25. (withdrawn) A heat exchanger according to claim 24,
wherein said second protrusions are each formed at a part facing the inside of said flat plate portion.

26. (currently amended) A heat exchanger according to claim 24,
wherein said exhaust gas passage (~~tube~~) has a flat section, and [[a]] the
plurality of said second protrusions are arranged in a staggered fashion along ~~the short~~
~~diameter~~ a width of said tube.

27. (currently amended) A heat exchanger according to claim 24,
wherein said second protrusions are formed on [[the]] a longitudinal end
portion of said [[tube]] exhaust gas passage.

28. (currently amended) A heat exchanger according to claim 24, wherein
[[a]] the plurality of said [[tubes]] exhaust gas passages are arranged in
parallel to each other, and a header tank communicating with [[a]] the plurality of said
[[tubes]] exhaust gas passages is coupled by being fitted in a fitting portion at each of
the longitudinal end portions of each of [[a]] the plurality of said [[tubes]] exhaust gas
passages and

~~wherein the~~ a shape of said fitting portion at one longitudinal end portion
of said tube and [[the]] a shape of said fitting portion at the other longitudinal end portion
of said tube are different from each other.

29. (currently amended) A heat exchanger according to claim 24,

wherein a plurality of third protrusions projected inward of said ~~[[tube]]~~ exhaust gas passage for setting said fins in position with respect to said ~~[[tube]]~~ exhaust gas passage are formed on said tube.

30. (currently amended) A heat exchanger according to claim 1, wherein
said plurality of exhaust gas ~~passage~~ passages includes a plurality of tubes arranged parallel to each other, and a header tank communicating with ~~[[a]]~~ the plurality of ~~[[said]]~~ tubes is coupled by being fitted in a fitting portion at each of ~~[[the]]~~ longitudinal end portions of each of ~~[[a]]~~ the plurality of ~~[[said]]~~ tubes, and
~~wherein the~~ a shape of said fitting portion at one longitudinal end portion of said tube and ~~[[the]]~~ a shape of said fitting portion at the other longitudinal end portion of each of said tubes are different from each other.

31. (currently amended) A heat exchanger according to claim 1,
wherein ~~[[the]]~~ an upstream end portion of each of said louvres ~~in said exhaust gas flow~~ is formed continuously from ~~[[the]]~~ a bottom surface of said corrugated fin.

32. (currently amended) A heat exchanger according to claim 1,
wherein ~~[[the]]~~ an upstream end portion of each of said louvres ~~in said exhaust gas flow~~ has ~~[[such]]~~ a height (H) such that ~~the air~~ gas flow riding over said louvre reaches ~~[[the]]~~ a root of said louvre.

33. (currently amended) A heat exchanger for exchanging heat between [[the]] exhaust gas emitted from [[the]] an internal combustion engine and a cooling fluid, the heat exchanger comprising:

a flat exhaust gas passage through which said exhaust gas flows therein;

[[and]]

a plurality of corrugated fins [[each]] arranged in said exhaust gas passage; and

a plurality of louvres ~~which are~~ formed on [[the]] an inner wall of said exhaust gas passage, each of the plurality of louvres being inclined at a predetermined angle to a direction of said exhaust gas flow ~~direction, and~~ , wherein

each of said louvres include a first part having ~~a such~~ a height so as to form a swirl reaching [[the]] a bottom surface of said [[fin]] louvre, and a second part which is higher than said first part and located downstream of said first part in said direction of said exhaust gas flow[[.]]; and

the plurality of said louvres are arranged in a staggered manner such that each of said louvres is arranged along the direction of said exhaust gas flow at alternately different predetermined angles with respect to the direction of said exhaust gas flow.

34. (new) A heat exchanger for exchanging heat between an exhaust gas of an internal combustion engine and a cooling fluid, comprising:

a plurality of flat exhaust gas passages through which said exhaust gas flows therein; and

a plurality of corrugated fins arranged in each of said exhaust gas passages to promote heat exchanging between said exhaust gas and said cooling fluid, each of said fins including a plurality of flat plate portions and a plurality of side wall portions as viewed from a direction of the exhaust gas flow; wherein

a plurality of louvres are disposed on inner walls of said exhaust gas passages along the direction of the exhaust gas flow, a surface of each of said louvres having a height measured from said inner wall which increases in the direction of said exhaust gas flow, and

the plurality of louvres are arranged in a staggered manner such that each of said louvres is arranged along the direction of said exhaust gas flow at alternately different predetermined angles with respect to the direction of said exhaust gas flow.